REFERENCE MONITOR

Reference Monitor Controllers
User Handbook

RM-MC1L	Monitor Controller, Single Stereo Input & Output With Light Control
RM-MC4L	Monitor Controller, 4 Stereo Inputs, 1 Output With Light Control
RM-MC51L	Monitor Controller, 5.1 Stereo Inputs & Outputs With Light Control
RM-MCL	Monitor Light Controller, 3 Button, TX-STANDBY-REH

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This handbook is for use with the following products.

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RM-MC51L	Monitor Controller, 5.1 Stereo Inputs & Outputs With Light Control
RM-MCL	Monitor Light Controller, 3 Button, TX-STANDBY-REH

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Warranty

Warranty and Liability

Important: the purchaser is advised to read this clause

(a) The Company agrees to repair or (at its discretion) replace Goods which are found to be defective (fair wear and tear excepted) and which are returned to the Company within 12 months of the date of despatch provided that each of the following are satisfied:

(i) notification of any defect is given to the Company immediately upon its becoming apparent to the Purchaser;

(ii) the Goods have only been operated under normal operating conditions and have only been subject to normal use (and in particular the Goods must have been correctly connected and must not have been subject to high voltage or to ionising radiation and must not have been used contrary to the Company's technical recommendations);

(iii) the Goods are returned to the Company's premises at the Purchaser's expense;

(iv) any Goods or parts of Goods replaced shall become the property of the Company;

(v) no work whatsoever (other than normal and proper maintenance) has been carried out to the Goods or any part of the Goods without the Company's prior written consent;

(vi) the defect has not arisen from a design made, furnished or specified by the Purchaser;

(vii) the Goods have been assembled or incorporated into other goods only in accordance with any instructions issued by the Company;

(viii) the defect has not arisen from a design modified by the Purchaser;

(ix) the defect has not arisen from an item manufactured by a person other than the Company.

In respect of any item manufactured by a person other than the Company, the Purchaser shall only be entitled to the benefit of any warranty or guarantee provided by such manufacturer to the Company.

(b) In respect of computer software supplied by the Company the Company does not warrant that the use of the software will be uninterrupted or error free.

(c) The Company accepts liability:

(i) for death or personal injury to the extent that it results from the negligence of the Company, its employees (whilst in the course of their employment) or its agents (in the course of the agency);

(ii) for any breach by the Company of any statutory undertaking as to title, quiet possession and freedom from encumbrance.

(d) Subject to conditions (a) and (c) from the time of despatch of the Goods from the Company's premises the Purchaser shall be responsible for any defect in the Goods or loss, damage, nuisance or interference whatsoever consequential economic or otherwise or wastage of material resulting from or caused by or to the Goods. In particular the Company shall not be liable for any loss of profits or other economic losses. The Company accordingly excludes all liability for the same.

(e) At the request and expense of the Purchaser the Company will test the Goods to ascertain performance levels and provide a report of the results of that test. The report will be accurate at the time of the test, to the best of the belief and knowledge of the Company, and the Company accepts no liability in respect of its accuracy beyond that set out in Condition (a).

(f) Subject to Condition (e) no representation, condition, warranty or other term, express or implied (by statute or otherwise) is given by the Company that the Goods are of any particular quality or standard or will enable the Purchaser to attain any particular performance or result, or will be suitable for any particular purpose or use under specific conditions or will provide any particular capacity, notwithstanding that the requirement for such performance, result or capacity or that such particular purpose or conditions may have been known (or ought to have been known) to the Company, its employees or agents.

(g) (i) To the extent that the Company is held legally liable to the Purchaser for any single breach of contract, tort, representation or other act or default, the Company's liability for the same shall not exceed the Price of the Goods.

(ii) The restriction of liability in Condition (g)(i) shall not apply to any liability accepted by the Seller in Condition (c).

(h) Where the Goods are sold under a consumer transaction (as defined by the Consumer Transactions (Restrictions on Statements) Order 1976) the statutory rights of the Purchaser are not affected by these Conditions of Sale.

Unpacking the Reference Monitor Controller

The Reference Monitor Controller is shipped with the following equipment. Please check your packaging to ensure that you have all of the items below. If anything is missing, please contact the supplier of your equipment immediately.

Item	Quantity Reference Monitor Controller
Reference Monitor Controller	1
IEC mains lead fitted with moulded mains plug	1
Handbook and warranty card	1

Fig A: Packing List

Each Reference Monitor Controller is shipped in protective packaging and should be inspected for damage before use. Where an item is found to have transit damage, notify the carrier immediately with all the relevant details of the shipment. Packing materials should be kept for inspection and also for if the product needs to be returned.

Returning the Warranty Card

In order to register the date of purchase so that we can keep you informed of any design improvements or modifications, it is important to complete the warranty registration document that is enclosed and return it to Sonifex Ltd in the UK.

For your own records you should write down the serial number (which can be found on the rear of the Reference Monitor Controller.

Serial Number	.....

Safety Information

Safety of Mains Operated Equipment

CE This equipment has been designed to meet the safety regulations currently advised in the country of purchase and it conforms to the safety regulations specified by use of the CE Mark.

Warning : There are no user serviceable parts inside the equipment. If you should ever need to look inside the unit, always disconnect the mains supply before removing the equipment covers.

Voltage Setting Checks

Ensure that the machine operating voltage is correct for your mains power supply by checking the box in which your Reference Monitor Controller was supplied. The voltage is shown on the box label. Please note that all Reference Monitor Controllers have a universal power supply, 85-264V AC, 47-63Hz.

Fuse Rating

The Reference Monitor Controller is supplied with a single fuse in the live conducting path of the mains power input. For reasons of safety it is important that the correct rating and type of fuse is used. Incorrectly rated fuses could present a possible fire hazard, under equipment fault conditions. The fuse rating for the Reference Monitor Controller is:

1A 5 x 20mm SB

The active fuse is fitted on the outside rear panel of the unit.

Power Cable and Connection

An IEC power connector is supplied with the Reference Monitor Controller which has a moulded plug attached – this is a legal requirement. If no moulded plug has been supplied with your Reference Monitor Controller, please contact your supplier, because an IEC connector is always supplied from the Sonifex factory.

If for any reason, you need to use the Reference Monitor Controller with a different power cable, you should use the following wiring guidelines.

Wire Colour	Connection
Green, or green and yellow	Earth (E)
Blue, or black	Neutral (N)
Brown, or red	Live (L)

Fig B: Power Connections

Connect the equipment in accordance with the connection details and before applying power to the unit, check that the machine has the correct operating voltage for your mains power supply.

Important Note : The terminal marked on the rear panel must be earthed.

Ordering the Correct Mains Lead

When ordering a Reference Monitor Controller from Sonifex, it is helpful if you can specify your required operating voltage and mains lead. After the product code add:

UK, for 230V, UK 3 pin to IEC lead	
EC, for 230V, European Schuko 2 pin to IEC lead	
US, for 115V, 3 pin to IEC lead	
AU for 230V, Australasian 3 pin to IEC lead	

Fig C: Mains Lead Table

E.g. order RM-MC1L UK for a UK IEC lead to be supplied.

Installation Information

Atmosphere

The units should be installed in an area that is not subject to excessive temperature variation (<0°C, >50°C), moisture, dust or vibration.

Electromagnetic Radiation

The cover is connected to earth by means of the fixing screws. It is essential to maintain this earth ground connection to ensure a safe operating environment and provide electromagnetic shielding.

WEEE & RoHS Directives - Sonifex Statement

The Waste Electrical and Electronic Equipment (WEEE) Directive was agreed on 13 February 2003, along with the related Directive 2002/95/EC on Restrictions of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS).

The **Waste Electrical and Electronic Equipment Directive (WEEE)** aims to minimise the impacts of electrical and electronic equipment on the environment during their life times and when they become waste. It applies to a huge spectrum of products. It encourages and sets criteria for the collection, treatment, recycling and recovery of waste electrical and electronic equipment. All products manufactured by Sonifex Ltd have the WEEE directive label placed on the case. It gives a contact for individuals who are unsure about the correct procedure when the product has reached its "end of use".

Sonifex Ltd will be happy to give you information about local organisations that can reprocess the products, or alternatively all products that have reached "end of use" can be returned to Sonifex and will be reprocessed correctly free of charge.

Sonifex Ltd has phased out the use of certain hazardous substances identified in the European Union's **Restriction of Hazardous Substances (RoHS)** directive. The RoHS directive limits the use of certain hazardous substances currently used in EEE manufacture, including lead, mercury, cadmium, hexavalent chromium, and halide-containing compounds PBB (polybrominated biphenyl) and PBDE (polybrominated diphenyl ether). Elimination of these substances will result in more environmentally friendly recycling of electronic equipment. For the products which Sonifex manufacture, the main area where products were affected was in the use of lead for manufacturing and assembling electronics circuit boards.

Sonifex Ltd practices lead-free (LF) manufacturing processes. LF solder is used on the surface-mount PCB manufacturing processes and for hand soldering. The printed circuit boards (PCBs) used are either gold plated, or immersion tin plated, both of which use no lead. Historically the PCBs were hot air solder levelled (HASL) PCBs which used tin/lead based solder.

The manufacturing processes include the assembly of purchased components from various sources. Product is offered as RoHS compliant, or LF, only after sufficient evidence is received from the component manufacturers that their components are RoHS compliant. Sonifex Ltd relies solely on the distributor, or manufacturer, of the components for identification of RoHS compliance. Thus whilst every effort is made to ensure compliance, Sonifex Ltd makes no warranty, or certification, or declaration of compliance concerning said components.

Sonifex Ltd defines "Lead Free" as pertaining to any product, which has been manufactured by Sonifex Ltd using components which have been declared by the manufacturers as "Lead Free". All statements by Sonifex Ltd of RoHS compliance are based on component manufacturer documentation.

REFERENCE MONITOR

1 Reference Monitor Controllers Introduction

The Reference Monitor Controllers are a range of 1U rack-mount audio production control units, for providing source selection, volume, DIM and CUT controls for external analogue monitors, together with light controls for the Sonifex SignalLED range of studio signs, or similar.

Each of the products has a light control section. This section has 3 buttons: Transmit (TX), STANDBY and Rehearse (REH). The TX and REH buttons control opto-isolated outputs on the rear panel remote connector, and these provide a direct control interface to the Sonifex SignalLED illuminated studio sign, allowing twin signs to be controlled individually.

The Standby button initiates a 2 minute countdown where the TX and REH buttons and their associated remote outputs flash alternately. After the 2 minutes has elapsed, the TX output remains on.

The remote port also has open-collector tally outputs for Transmit (TX) and Rehearse (REH), as well as remote input control for the audio controls DIM and CUT, and the light controls TX, Standby and REH. There is also a +12VDC source at 200mA maximum.

The TX, STANDBY and REH buttons can optionally be replaced if you want to use different buttons for other applications.

There are four Monitor Controller products:

RM-MC1L	Monitor Controller, Single Stereo Input & Output With Light Control
RM-MC4L	Monitor Controller, 4 Stereo Inputs, 1 Output With Light Control
RM-MC51L	Monitor Controller, 5.1 Stereo Inputs & Outputs With Light Control
RM-MCL	Monitor Light Controller, 3 Button, TX-STANDBY-REH

2 RM-MC1L Monitor Controller

The RM-MC1L is a stereo unit with a single stereo balanced analogue input and output. Useful in a production environment, the unit allows you to control the audio level to external monitors and to DIM the audio, or CUT it completely with simple front panel controls, or remote external inputs. It has a master volume control that adjusts the attenuation on the output channels from 0dB down to -86dB. A CUT control mutes the audio outputs when enabled, whilst a DIM control attenuates the audio output channels by a pre-set amount from -2dB to -23dB. All of the buttons on the front panel are illuminated by LEDs and the brightness can be changed to better suit the environment in which the unit is used.

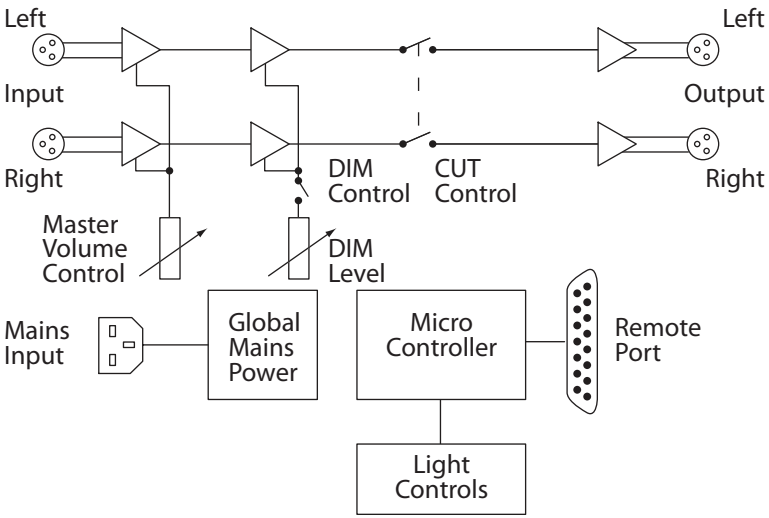


Fig 1-1: RM-MC1L Block Diagram

Front Panel Controls & Indicators

Fig 1-2: RM-MC1L Monitor Controller, Single Stereo Input & Output With Light Control

Power LED

The power LED illuminates blue whilst power is present within the unit. If this indicator is not on, the most likely reason is simply the absence of mains power, but under fault conditions it may also indicate a ruptured mains fuse or a problem with the internal power supply module.

Light Control Buttons

The three light control buttons; Transmit (TX), Standby and Rehearse (REH) provide remote controls for the Sonifex SignalLED range of studio signs, or similar device. The optically isolated drivers and the open-collector tally outputs associated with the TX and REH buttons are activated whenever the button LEDs are illuminated.

The TX button can be pressed at any time, regardless of the state of the other two light controller buttons. If the REH button is active when TX is pressed, REH will be deactivated. If the Standby countdown is currently active when TX is pressed, the countdown is cancelled and both the Standby and REH buttons are deactivated.

The Standby button controls a 2 minute countdown where the TX and REH buttons and their associated remote outputs flash alternately. To start the 2 minute Standby countdown, which can only be initiated if the TX control is currently inactive, simply press the Standby button. The button will illuminate white to show the countdown is active and the TX and REH buttons will flash red and blue respectively for 0.5 seconds each. After the 2 minutes has elapsed, the Standby and REH buttons and associated remote outputs are deactivated while the TX remains on.

The Standby countdown can be cancelled at any time during the 2 minutes by pressing the Standby button a second time. The TX button will be deactivated and the REH button will return to the state it was in prior to the countdown starting.

The REH button can also be pressed at any time, regardless of the state of the other two light controller buttons. If the TX button is active when REH is pressed, TX is deactivated.

If the Standby countdown is currently active, the countdown is cancelled and both the TX and Standby buttons are deactivated.

DIM Button

The DIM button attenuates the audio level at the output by a pre-set amount from -2dB to -23dB. The attenuation is applied after any level adjustment made by the master volume control. The DIM level is set by adjusting the DIM Level potentiometer on the rear panel. The DIM button has a latching action; press to activate, press again to deactivate. When the DIM button is active it illuminates yellow.

The DIM button is also used to set the brightness of the LEDs that illuminate all of the front panel buttons. When power is applied to the unit, all of the LEDs on the front panel are illuminated for 1 second. During this period, pressing the DIM button will adjust the LED brightness to one of the three available levels. Each time the button is pressed, the 1 second timeout period is restarted. When the required LED brightness level has been set, simply allow the unit to return to normal operation.

An 'active low' remote input is available for remotely controlling the DIM operation.

CUT Button

The CUT button mutes the audio at the output. The CUT button has a latching action; press to activate, press again to deactivate. When the CUT button is active it illuminates red.

An 'active low' remote input is available for remotely controlling the CUT operation.

Master Volume Control

The Master Volume Control adjusts the attenuation on all of the audio channels from 0dB down to -86dB.

Rear Panel Controls & Connectors

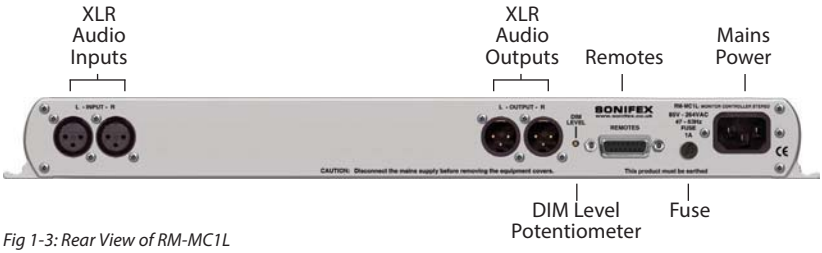


Fig 1-3: Rear View of RM-MC1L

DIM Level Adjustment Potentiometer

The DIM level potentiometer sets the attenuation applied to audio output when the DIM button is active. Turn the potentiometer clockwise to decrease the DIM attenuation level and clockwise to increase it (altering the audio level by -2dB to -23dB).

Audio Inputs

The single stereo audio input is via two XLR-3 pin socket connectors with the following pin assignments:

Pin 1: Ground
Pin 2: Phase
Pin 3: Non-phase

Audio Outputs

The single stereo audio output is via two XLR-3 pin plug connectors with the following pin assignments:

Pin 1: Ground
Pin 2: Phase
Pin 3: Non-phase

Remote Port

The Reference Monitor Controller's remote port has 2 optically isolated drivers for the Transmit (TX) and Rehearse (REH) controls that provide a direct control interface to the Sonifex SignalLED illuminated studio signs. To drive a SignalLED studio sign from these drivers, the Emitter connection would typically be connected to 0V and the collector connection would be connected to one of the active low signalling inputs.

The remote port also provides 2 open-collector tally outputs for Transmit and Rehearse, and 5 active low inputs to activate the Transmit, Rehearse, Standby, CUT and DIM controls.

The GPIO port connector is a 15-way female D-type with the following pin assignments:

Pin	Function	Description
1	Digital Ground	0V
2	TX Output Collector	Collector of optically-isolated driver for TX
3	REH Output Collector	Collector of optically-isolated driver for REH
4	REH Output Tally	Open collector driver active when REH is active
5	STANDBY Remote Input	Active low input to trigger STANDBY
6	CUT Remote Input	Active low input to trigger CUT
7	Digital Ground	0V
8	Digital Ground	0V
9	TX Output Emitter	Emitter of optically-isolated driver for TX
10	TX Output Tally	Open collector driver active when TX is active
11	REH Output Emitter	Emitter of optically-isolated driver for REH
12	TX Remote Input	Active low input to trigger TX
13	REH Remote Input	Active low input to trigger REH
14	DIM Remote Input	Active low input to trigger DIM
15	Fused Power	+12VDC @ 200mA max

Mains Power

Mains power is applied via a standard three-pin IEC male socket. Mains voltages between 85V and 264V AC at frequencies between 47 and 63Hz are accepted without adjustment. A 1A, 5 x 20mm SB fuse is used. The Earth pin MUST be connected to ensure safety.

3 RM-MC4L Monitor Controller

The RM-MC4L has four stereo balanced analogue inputs with a single stereo balanced output. The RM-MC4L has the same master volume control, CUT, DIM, light control functions, remote operation and adjustments as the RM-MC1L unit.

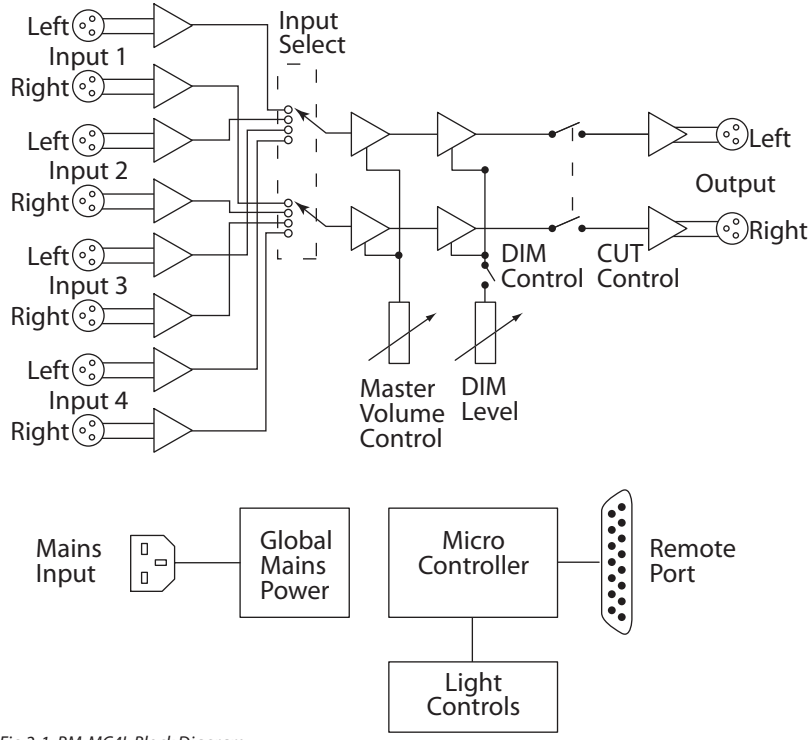


Fig 2-1: RM-MC4L Block Diagram

Front Panel Controls & Indicators

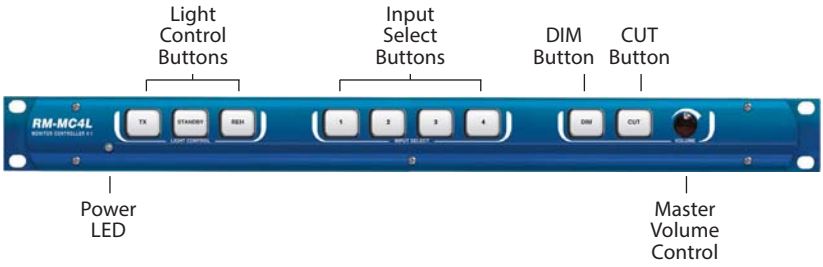


Fig 2-2: RM-MC4L Monitor Controller, 4 Stereo Inputs, 1 Stereo Output With Light Control

Input Select Buttons

The four input select buttons select which of the four stereo inputs is routed to the single stereo output. The currently selected input button illuminates green and the unit defaults to input 1 on power up.

For details of the other RM-MC4L Monitor Controller front panel controls and indicators, please refer to the RM-MC1L description.

Rear Panel Controls & Connectors

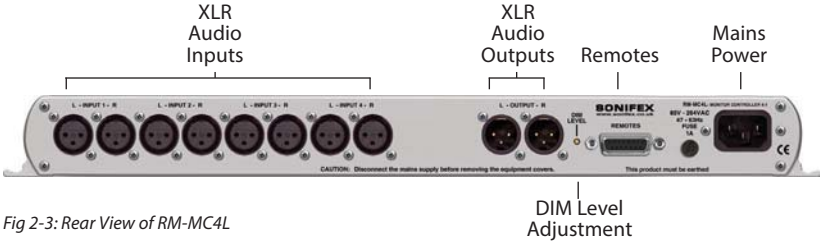


Fig 2-3: Rear View of RM-MC4L

Audio Inputs

The RM-MC4L has four stereo audio inputs via eight XLR-3 pin socket connectors with the following pin assignments:

Pin 1: Ground
Pin 2: Phase
Pin 3: Non-phase

For details of the other RM-MC4L Monitor Controller rear panel controls and connectors, please refer to the RM-MC1L description.

4 RM-MC51L Monitor Controller

The RM-MC51L is a monitor controller for surround sound applications with 6 balanced analogue inputs and 6 balanced analogue outputs. It is used in situations where you need to adjust the volume, or CUT, or DIM all of the speakers in a 5.1 surround system. Alternatively, the unit can be used as a global volume control for 6 analogue outputs. The RM-MC51L has the same master volume control, CUT, DIM and light control functions and adjustments as the RM-MC1L unit.

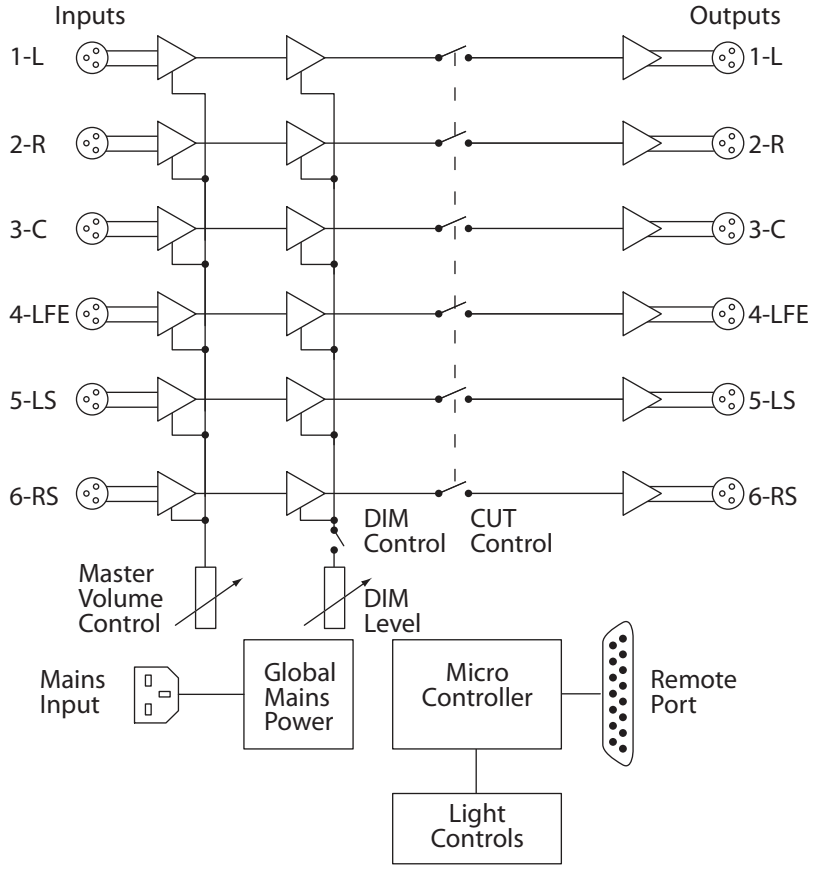


Fig 4-1: RM-MC51LBlock Diagram

Front Panel Controls & Indicators

Fig 4-2: RM-MC51L Monitor Controller, 5.1 Stereo Inputs & Outputs With Light Control

For details of the RM-MC51L Monitor Controller front panel controls and indicators, please refer to the RM-MC1L description.

Rear Panel Controls & Connectors

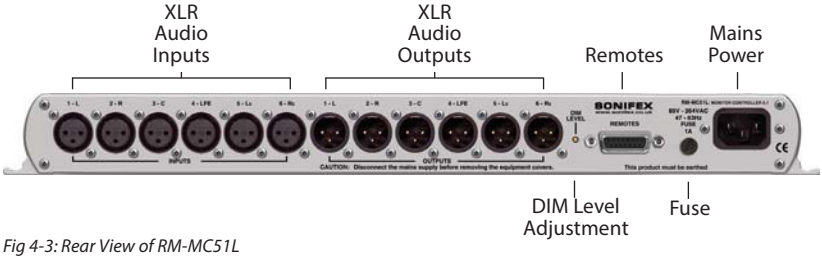


Fig 4-3: Rear View of RM-MC51L

Each audio input and output on the RM-MC51L is labeled with a channel number and a corresponding 5.1 channel surround sound channel name.

Audio Inputs

The RM-MC51L has six audio inputs via XLR-3 pin socket connectors with following pin assignments:

Pin 1: Ground
Pin 2: Phase
Pin 3: Non-phase

Audio Outputs

The six audio outputs are via XLR-3 pin plug connectors with the following pin assignments:
Pin 1: Ground
Pin 2: Phase
Pin 3: Non-phase

For details of the other RM-MC51L Monitor Controller rear panel controls and connectors, please refer to the RM-MC1L description.

5 RM-MCL Monitor Controller

The RM-MCL is a simple light controller for controlling a TX - STANDBY - REH light system in a production studio, as detailed in the RM-MC1L description. It has no audio inputs or outputs.

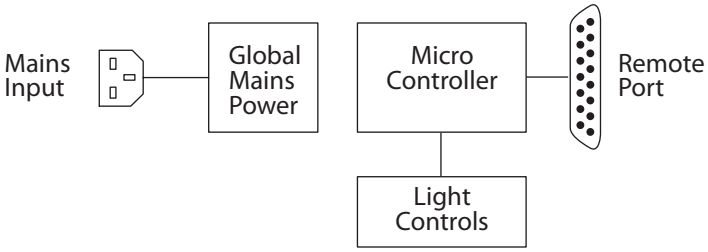


Fig 5-1: RM-MCL Block Diagram

Front Panel Controls & Indicators

Fig 5-2: RM-MCL Monitor Light Controller, 3 Button, TX-STANDBY-REH

Light Control Buttons

On the RM-MCL, the Standby button is used to set the brightness of the LEDs that illuminate all of the front panel buttons. When power is applied to the unit, all of the LEDs on the front panel are illuminated for 1 second. During this period, pressing the Standby button will adjust the LED brightness to one of the three available levels. Each time the button is pressed, the 1 second timeout period is restarted. When the required LED brightness level has been set, simply allow the unit to return to normal operation.

For details of the other Light Control button functions on the RM-MCL Monitor Controller, please refer to the RM-MC1L description.

Rear Panel Controls & Connectors

Fig 5-3: Rear View of RM-MC1L

For details of the RM-MCL Monitor Controller rear panel connectors, please refer to the RM-MC1L description.

6 Technical Specification

Audio Specification	
Input Impedance:	>20kΩ
Maximum Input Level:	+25dBu
Output Impedance:	<50 Ω
Maximum Output Level:	+25dBu
Attenuation Range:	>86dB
DIM Attenuation Range:	Adjustable -3dB to -23dB via rear panel potentiometer
Common Mode Rejection:	>66dB typical
Distortion:	<0.04% ref +8dBu
Crosstalk:	<-80dB @ 1kHz input, ref 0dBu

Front Panel Operation Controls	
Light Control (All units):	Transmit (TX), Standby & Rehearse (REH) illuminated buttons
Channel Select (RM-MC4L):	1, 2, 3 & 4 illuminated buttons
Audio Controls:	DIM & CUT illuminated buttons (not on RM-MCL)
Volume Control:	Rotary potentiometer for output attenuation on front panel (not on RM-MCL)

Rear Panel Connections	
Audio Inputs (RM-MC1L):	2 x XLR 3-pin female (balanced)
Audio Inputs (RM-MC4L):	8 x XLR 3-pin female (balanced)
Audio Inputs (RM-MC51L):	6 x XLR 3-pin female (balanced)
Audio Outputs (RM-MC1L & RM-MC4L):	2 x XLR 3-pin male (balanced)
Audio Outputs (RM-MC51L):	6 x XLR 3-pin male (balanced)
Remote I/O Port:	15 way D-type socket
Mains Input:	Filtered 3-pin IEC male, continuously rated 85-264VAC, 47-63Hz, fused

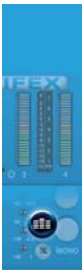
6 TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION

Power Consumption:	
RM-MC1L	Peak 10W, average 4W
RM-MC4L	Peak 10W, average 6W
RM-MC51L	Peak 10W, average 7W
RM-MCL	Peak 10W, average 2W
Fuse Rating:	Anti-surge fuse 1A, 20 x 5mm

Equipment Type	
RM-MC1L:	Monitor controller, single stereo input and output with light control
RM-MC4L:	Monitor controller, 4 stereo inputs, 1 stereo output with light control
RM-MC51L:	Monitor controller, 5.1 stereo inputs and outputs with light control
RM-MCL:	Monitor light controller, 3 buttons, TX-STANDBY-REH

Physical Specification	
Dimensions (Raw):	48cm (W) x 10.8cm (D) x 4.3cm (H) 19" (W) x 4.3" (D) x 1.7" (H) (1U)
Dimensions (Boxed):	58.5cm (W) x 22.5cm (D) x 7cm (H) 23" (W) x 8.9" (D) x 2.8" (H)
Weight:	Nett: 1.3kg Gross: 1.9kg Nett: 2.9lbs Gross: 4.2lbs



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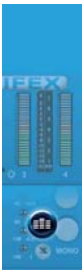

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